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THE MINERAL INDUSTRIES OF CANADA,
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THE MINERAL INDUSTRIES OF CANADA

1933

(Abridged Edition)

MINES BRANCH
DEPARTMENT OF MINES
OTTAWA, CANADA
1934

No. 749

CANADA—DEPARTMENT OF MINES
HON. W. A. GORDON, Minister; CHARLES CAMSELL, Deputy Minister
MINES BRANCH—JOHN McLEISH, Director

THE MINERAL INDUSTRIES OF CANADA 1933

(Abridged Edition)

COMPILED BY
A. H. A. ROBINSON

PRINTED BY
J. O. PATENAUDE, KING'S PRINTER
OTTAWA
1934

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J. O. PATENAUDE
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1934

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PREFACE

This small pamphlet has been specially prepared to meet a demand for an inexpensive publication suitable for widespread distribution, particularly in Great Britain, at exhibitions and fairs where Canadian minerals are being displayed. It may also be of interest to the casual reader and to the junior student in mining.

Mines Branch Report No. 738, "The Mineral Industries of Canada, 1933", of which the present pamphlet, as indicated on the title-page, is an abridged edition, comprises some 116 pages of text, including 34 photographic illustrations of Canadian mining, together with a mineral map of Canada.

The reader is referred to the last page of this pamphlet for information as to the availability of general and detailed information on Canadian mineral resources and mining.

JOHN MCLEISH,
Director.

MINES BRANCH,
DEPARTMENT OF MINES
OTTAWA, CANADA,
OCTOBER, 1934.

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INTRODUCTORY

The mineral industry in Canada may be said to have had its inception in the discovery of coal in Cape Breton more than 200 years ago, but until comparatively recent times it took no very high place in the economic life of the Dominion. During the last third of a century, however, its growth has been remarkably rapid, as the following table will show.

Annual Value of Canada's Mineral Production at 5-year Intervals since 1900

—	Metals and metallic minerals	Non-metallics exclusive of clay products	Clay products and structural materials	Total
	$	$	$	$
1900	40,521,807	17,225,975	6,372,901	(a) 64,420,683
1905	36,946,212	22,224,560	9,608,267	(a) 69,078,999
1909	44,156,841	31,141,251	16,533,349	91,831,441
1914	70,[illegible]	43,467,229	[illegible]	128,863,075
1924	[illegible]	76,002,087	[illegible]	176,686,390
1929	107,[illegible]	71,796,009	35,380,[illegible]	209,583,403
1932	150,[illegible]	97,861,356	58,534,[illegible]	310,850,246
1933	149,[illegible]	87,[illegible]	45,484,[illegible]	282,[illegible]

(a) Includes $300,000 for products not reported.

Mining to-day shares with agriculture and forestry the distinction of being one of Canada's three great basic industries, and during the present business depression metal-mining has proved one of the most stable, if not the stablest, of all Canadian industries. This will be made more apparent than is indicated by the figures given in the table above when it is stated that the decreased value of metal production in 1933 as compared with 1929, the year of maximum production, is due more to lower base-metal prices than to lessened volume of output.

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The present pamphlet is an attempt to give merely a cursory, bird's-eye view of the mineral industry in Canada in its existing stage of development; future potentialities are practically ignored. It must not be presumed, however, that these are therefore negligible. On the contrary, given equally favourable conditions, there is no reason to suppose that expansion will not continue in the future at a rate that will at least compare favourably with that in the past; and it is still too soon to attempt to forecast the ultimate limits Canada's mineral industry will attain either in the variety or volume of its products.

In the case of each mineral, or mineral product, there is given in the text, in addition to production figures, a brief statement of exports and imports, or other general indication of the possibilities for expansion in Canada's international trade in minerals. The Dominion's actual production of nickel, copper, lead, zinc, and asbestos, as well as for many less important products, is far in excess of any possible domestic demand for many years to come and, hence, must for the most part be marketed abroad. On the other hand the country's resources in such an essential article as petroleum are woefully lacking; and as regards iron ore and coal, although deposits of these are abundant, they are so situated and of such quality as to be available for satisfying only part of the domestic needs.

Production figures for 1933, wherever used, are preliminary figures and hence subject to some slight revision. Export and import figures are final.

The ton used throughout is the short ton of 2,000 pounds.

MINERAL PRODUCTS

ALUMINIUM

Aluminium ores are not known to occur in Canada in commercial quantity, nevertheless, thanks to abundant and cheap hydro-electric power, Canada, since 1927, has been the world's second largest producer of aluminium metal. The ore used—bauxite—is obtained from British Guiana and the United States. Production plants are located at Arvida and Shawinigan Falls in the province of Quebec.

In 1933 there was produced in Canada some 17,800 tons of aluminium, equivalent to about 12 per cent of the world's production and to 60 per cent of that produced within the Empire. Aluminium and its products, chiefly the former, were exported to the value of $6,301,974 and imports, almost entirely of manufactures of aluminium, were valued at $2,813,388.

ANTIMONY

A small amount of antimony is contained in some of the silver-lead-bismuth bullion obtained during the treatment of cobalt silver ores at Deloro, Ontario. Bullion of this type is shipped to the United States, where the contained antimony is recovered—as a by-product—along with the other metals. The Consolidated Mining and Smelting Company also obtain some impure by-product antimony in connection with silver refining operations at Trail, British Columbia; this is allowed to accumulate until a plant for its refining has been installed.

With the exception of some small experimental shipments, no antimony ore or refined antimony has been produced in Canada since 1917; previous to that there was for a number of years a small intermittent production from the Maritime Provinces. No production was recorded in 1933. Imports in that year, however, amounted to 626,854 pounds of metallic antimony valued at $32,796 and 85,999 pounds of antimony salts valued at $6,629.

ARSENIC

Arsenic-bearing minerals are of widespread occurrence in Canada. Recorded production, however, is confined to by-product white arsenic (As_2O_3) obtained in the course of treating the silver-cobalt-arsenic ores of Cobalt, Ontario, either at the Deloro Smelting and Refining Company's plant at Deloro, Ontario, or at foreign plants. Gold-bearing arsenical concentrates are produced at the Beattie gold mine in Quebec and at the Bralorne gold mine in British Columbia. These are shipped to the United States for treatment, but the contained arsenic is not paid for and does not appear in Canadian records.

In 1933 Canada produced white arsenic and arsenic in other forms to the value of $56,534. Exports were chiefly white arsenic, to the value of $33,778; imports, consisting chiefly of arsenate of lead and arsenate of lime, were valued at $70,574.

ASBESTOS

Asbestos of the chrysotile variety occurs in a number of places in Canada—in the provinces of Quebec, Ontario, and British Columbia. It is mined, however, in one general locality only, the Eastern Townships of the province of Quebec, where, centred on the town of Thetford, operations have been continuous since 1880. The most important deposits are at Black Lake, Coleraine township; at Thetford and Robertsonville, Thetford township; at East Broughton, Broughton township; and Danville, Shipton township.

Canada is the world's largest producer of asbestos and markets its output in a wide variety of grades; the shorter, non-spinning grades constituting the larger part of the production by volume. Production of all grades in 1933 amounted to 158,367 tons valued at $5,211,177. Exports, chiefly to United States, were: 78,701 tons of asbestos valued at $3,998,377; 70,296 tons of asbestos sand and waste worth $991,417; and manufactures of asbestos to the value of $73,044. Imports were manufactured asbestos to the value of $454,108.

BARITE

Occurrences of barite, also known as barytes and heavy spar, are found at a number of places in Canada; and barite has been mined in small quantity at various times

in the provinces of Nova Scotia, Quebec, and Ontario. Lafarge Lime Works in Nova Scotia was the only locality in which deposits were worked, though properties have been equipped for production but never put into steady operation, in Perkinswood and in Langmuir township in northern Ontario.

Production, which for some years has been unimportant, amounted in 1933 to only 20 tons valued at $40—a test shipment from an Ontario property. Imports were 1,587 tons valued at $28,275; there was also imported 5,691 tons of lithopone valued at $106,598 and 1,276 tons of blanc fixe valued at $11,590, neither of which barium compound is manufactured in Canada.

BENTONITE

Bentonite, for which many uses have been proposed, is a colloidal clay that is of widespread occurrence in thin seams and beds in the provinces of Alberta, British Columbia, and Saskatchewan. A little of this material has been shipped from Princeton to Vancouver, British Columbia for use in oil and gasoline refining and for admixture in concrete and cement; and some from Edson, to Edmonton, Alberta, to be used in making cosmetics.

Production, which so far has been of an experimental character, amounted to 55 tons valued at $1,365 in 1933. A certain amount of ground bentonite and bentonite products is imported from the United States, but, as much of this material is sold under trade names, its classification is difficult and it is not separately recorded.

BERYL

Probably the most promising known occurrence of beryl in Canada is in Lyndoch township, Renfrew county, Ontario, where between 1926 and 1932 some exploratory work was done on a pegmatite dyke carrying beryl in association with small amounts of rose quartz, zircon, columbite, and radioactive euxenite. Beryl has also been found in pegmatite dykes in the Pointe-du-Bois region in southeastern Manitoba, where it occurs in scattered crystals associated with small amounts of uraninite, tantalite and monazite.

With the exception of a few tons of crystals mined at odd times during the last ten years in the course of pros-

peeting, Canada has produced no beryl. A little Manitoba beryl, as well as other associated rare minerals, has been sold for cutting and polishing into jewellery, etc.

BISMUTH

No bismuth ores are mined in Canada, but bismuth is produced as a by-product of the refining of silver and lead ores. The Deloro Smelting and Refining Company, of Deloro, Ontario, who treat the silver-cobalt-nickel-arsenic ores of northern Ontario, obtain in the course of the process impure bismuth and a bismuth-bearing lead bullion. The latter is exported to the United States for refining. In British Columbia the Consolidated Smelting and Refining Company of Canada produce electrolytically refined bismuth from lead-refinery residues.

The recovery of bismuth as metal has been recorded in Canada since 1928. The total production in 1933 was 78,303 pounds valued at $81,442. Imports in the same year amounted to 180 pounds of metallic bismuth valued at $198 and bismuth salts to the value of $25,255. Most, if not all, of the Canadian production is exported.

BITUMINOUS SAND

An extensive deposit of bituminous sand, commonly called tar sand—probably the largest occurrence of solid asphaltic material known—outcrops at frequent intervals along the Athabaska river and its tributaries for an aggregate distance exceeding 200 miles, in the district centering about McMurray in the province of Alberta. The total estimated volume of the sand is 500 billion cubic yards, and analyses have shown that the bitumen content varies from less than one per cent to 20 per cent, many large portions of the deposit averaging 10 per cent or more.

There has been no commercial production as yet, but a total of about 8,000 tons has been mined at various times to investigate its properties as a road-surfacing material and as a source of bitumen and petroleum products. Experiments to determine its suitability for these purposes have given excellent results.

CADMIUM

All the cadmium produced in Canada is obtained as a by-product of the refining of zinc. The Consolidated Mining and Smelting Company of Canada produces refined cadmium at their plant at Trail, British Columbia, from precipitates obtained in the purification of zinc solution prior to electrolysis of the latter. The Hudson Bay Mining and Smelting Company also recover cadmium in small quantities in the form of "sponge" at their electrolytic zinc plant at Flin Flon in Manitoba.

Production of cadmium has been recorded in Canada only since 1928. The output in 1933 was valued at $78,733. Most of it is exported to Europe. No imports into Canada are recorded.

CEMENT

The only rock cement which is manufactured in large quantity in Canada is Portland cement, the raw materials used in the making of which—viz. limestone or marl, clay and gypsum—are of widespread occurrence in the Dominion.

Distributed over the provinces of Quebec, Ontario, Manitoba, Alberta, and British Columbia there are twelve Portland cement plants equipped to produce, in the aggregate, over 14,000,000 barrels a year. At present only a small part of this productive capacity is being utilized, output in 1933 being only 2,410,518 barrels.

CHROMITE

Chromite occurs in a number of places in the provinces of Quebec, British Columbia, and Ontario. Scattered deposits in serpentine in the counties of Megantic, Brome, Richmond, and Wolfe, in the province of Quebec, are the only ones that have been worked to any extent, though some work has been done on, and a few small shipments made from deposits found near Cascades in British Columbia. Considerable development work has also been done on apparently extensive but low-grade occurrences at Oboniga lake, west of lake Nipigon in northwestern Ontario.

Commercial production of chromite, all of which was from the province of Quebec, virtually ceased in 1926,

since when only occasional small test shipments have been made. Maximum production was 23,713 tons of ore and concentrates, in 1917; in 1933 a test shipment of 30 tons is recorded.

CLAYS AND CLAY-WORKING INDUSTRY

HEAVY CLAY PRODUCTS

The clay-working industry in Canada is engaged chiefly in the manufacture of heavy clay products such as brick, structural tile, drain tile, and sewer pipe. With the exception of Prince Edward Island, all the provinces contribute to the production of these products, which are manufactured from domestic clays and shales, except in the case of sewer pipe made in Quebec, which is manufactured from a mixture of domestic and imported clays.

In the manufacture of building brick and structural and drain tile, common surface clays and shales are used and, to a small extent, low-grade fireclays. Canada has immense resources of such clays and shales suitable for making good quality building brick of a wide range of texture and colour distributed throughout the nine provinces. Their distribution is so general that mention of any particular occurrences in a brief résumé would be rather misleading. For detailed information reference should be made to Departmental reports.

REFRACTORIES

Fireclays are graded according to their refractoriness, or the temperature which they can withstand in service, ranging from low-heat duty to medium- and high-heat duty. The high-heat duty or high-grade fireclays are of rare occurrence in Canada, but the lower grades are of broader distribution. With the exception of Prince Edward Island and Manitoba, all the provinces are known to possess deposits of fireclay, particularly in the southwestern part of Saskatchewan, where there is a series of exposures of refractory clays belonging to the Whitemud and Ravenscrag formations. However, many of the deposits are too remote from markets to be of immediate value. The paucity of fireclays in the neighbourhood of industrial centres has been a deterrent to the development of the refractories industry in Canada.

Fire-brick and fire-clay shapes are manufactured from siliceous clays in Nova Scotia, New Brunswick, Saskatchewan and British Columbia, while in Quebec and Ontario imported clays are used exclusively.

POTTERY AND CHINA CLAY

Clays suitable for the manufacture of stoneware and the better grades of pottery have been found in only a few places in Canada. Stoneware clays of good quality occur at Shubenacadie, Antrim, Musquodoboit, and Inverness in Nova Scotia; and in the Whitemud series in southern Saskatchewan, already referred to under refractory clays. Ball clay of excellent bonding power also occurs in this same series.

The only locality where china clay has been produced commercially is at St. Rémi d'Amherst, Quebec. There is no production at present. Deposits of high-grade, white-burning clays occur at the Mattagami, Abitibi, and Missinaibi rivers in Ontario. Some of these clays are very plastic and might be classed as ball clays.

A deposit of white-burning clay occurs at Punk island, lake Winnipeg, Manitoba; and at Williams lake, British Columbia, there is a deposit which, if not a true kaolin, is closely allied to it.

Stoneware is manufactured at Saint John, N.B., from Nova Scotia clay and at Medicine Hat from Saskatchewan clay.

Art pottery is made at Oshawa and Hamilton in Ontario and at a few small plants in New Brunswick, Ontario, and British Columbia, as well as at the stoneware potteries.

Sanitary ware is manufactured at two plants at St. Johns, Quebec, and electrical porcelain at Hamilton, Niagara Falls, Peterborough, and Georgetown, Ontario.

One plant at Kingston, Ontario, manufactures floor and wall tile.

Canada's output of clay products consisting mainly of brick and tile of various kinds, sewer pipe, and pottery, was valued at $2,256,588 in 1933. Imports consisting largely of earthenware and chinaware, refractories of various kinds, and raw clays, such as china clay and fire-clay, were valued at $4,961,265. Exports, valued at $141,552, were chiefly porcelain insulators and earthenware.

COAL

Canada's coal resources are enormous, but the important coalfields are all situated either in the extreme eastern or far western portions of the Dominion, while the chief consuming centres are in the more thickly populated and more highly industrialized central provinces of Ontario and Quebec. This results in an anomalous situation inasmuch as, in spite of great reserves, about one-half of the country's consumption is of imported coal, which can be more cheaply supplied to the greater part of the central provinces from foreign than from domestic sources.

The actual mining of coal is carried on in Nova Scotia, New Brunswick, Saskatchewan, Alberta, British Columbia, and Yukon. The output of Nova Scotia and New Brunswick is all bituminous coal; that of Manitoba and Saskatchewan all lignite. In Alberta, bituminous, sub-bituminous, and lignite are mined; in British Columbia bituminous and, formerly, a little anthracite. Yukon's small production for local use is bituminous. There are also some unexplored coalfields in the Northwest Territories and on the Arctic islands; and a small, as yet unexploited, lignite field in northern Ontario.

In 1933 Canada produced 11,885,078 tons of coal of all kinds; and imported, almost entirely from the United States and Great Britain, 11,185,224 tons. Exports were 259,233 tons.

COBALT

Virtually all Canada's cobalt has been derived from the silver-cobalt ores of northern Ontario, most of it as a by-product of silver mining, but some of it from ores mined primarily for their cobalt content.

Final recovery in commercial forms is done in part in Canada, in part abroad. The only plant in Canada now producing cobalt in the form either of pure metal or as oxide or salts is that of the Deloro Smelting and Refining Company at Deloro, Ontario.

Canada was at one time the world's chief producer of cobalt, but with the depletion of the silver mines there has been a corresponding falling off in cobalt production in recent years. In 1933, 459,247 pounds of cobalt as metal or contained in ore, oxides, and salts valued at

$594,944 were produced in Canada, as against a maximum production of 3,000,000 pounds in 1909. Most of the output is exported; imports are negligible.

COPPER

Canada now supplies about 9 per cent of the world's copper, the producing provinces in the order of their importance being Ontario, Quebec, British Columbia, and Manitoba. In the past a certain amount of copper has also been mined in Yukon, and promising, but still untouched, deposits are known to occur in the Northwest Territories. All the ores treated are sulphides and all carry in addition to copper one or other of such valuable metals as gold, silver, nickel, or zinc, in recoverable quantity.

In Ontario, which furnishes about 48 per cent of Canada's copper, virtually all the production is from the nickel-copper ores of the Sudbury district, and is really a by-product of nickel production. The ores mined are all smelted, and the resulting copper largely refined, locally, the International Nickel Company, much the largest producer in the district, having established through its subsidiary, the Ontario Refining Company, an electrolytic copper refinery at Copper Cliff, Ontario. The only other company operating, Falconbridge Nickel Mines, a much smaller concern, ship their output in the form of nickel-copper matte to their refinery in Norway for final treatment.

Practically all Quebec's copper, amounting to about 23 per cent of the total production of the Dominion, is at present being obtained from the Horne mine of Noranda Mines, Ltd., though there are also a number of other smaller mines in the province capable of producing considerable amounts under more favourable economic conditions. The ore at the Horne mine carries considerable gold as well as copper and temporarily at least is being operated primarily as a gold rather than as a copper mine. Blister copper from Noranda Mines' smelter is shipped to the same company's subsidiary, Canadian Copper Refiners, Ltd., at Montreal East, for electrolytic refining before being sold.

British Columbia produces a little over 14 per cent of Canada's copper, the two chief operating companies being

the Granby Consolidated Mining and Smelting Company, operating mines and a smelter at Anyox on the Pacific coast in the northwestern part of the province, and the Britannia Mining and Smelting Company, operating a mine and concentrating mill on Howe sound, near Vancouver, also on the coast. The Granby Company also own, and formerly operated, a large mine at Copper Mountain in the southern interior, but this is at present idle due to the low price of copper. Anyox, Copper Mountain, and Britannia ores all carry some gold, especially the last, which also in part carries considerable zinc. The Granby Company exports most of its Anyox output as blister copper; that of its Copper Mountain mine, when in operation, as concentrates. All the output of Britannia mine is exported as concentrates.

Manitoba's copper production, which in 1933 was slightly less than that of British Columbia, all came from the Hudson Bay Mining and Smelting Company's copper-zinc-gold mine at Flin Flon in the northwestern part of the province; the Sherritt-Gordon mine, operating on a similar ore in the same locality having been closed down in 1932 on account of the low price of copper. Flin Flon ore is smelted to blister copper at the mine and then shipped to the plant of Canadian Copper Refiners, Ltd., at Montreal East, to be refined to electrolytic copper.

Canada's total copper production in 1933 amounted to 149,968 tons, valued at $21,631,457, or only slightly less than the maximum production of 151,739 tons attained in 1930. The greater part of this output is exported in the form of refined copper and manufactured and semi-manufactured products. A very large portion, however, still goes abroad in unrefined form as ore, matte, blister copper, etc. Canada's imports of copper are virtually all in manufactured or semi-manufactured forms.

CORUNDUM

Corundum is found in Ontario in nepheline syenite rocks which cover large areas in the counties of Renfrew, Hastings, and Peterborough. It has been mined in quantity at Craigmont, in Raglan township, Renfrew county, and in Carlow township, Hastings county.

At one time Canada was the world's most important producer of corundum, a maximum output of 2,914 tons of

grain corundum having been obtained in 1906. With growing competition from artificial abrasives however, production fell off and, in 1921, ceased entirely.

DIATOMITE

Diatomite, also known as diatomaceous silica, infusorial earth, tripolite, fossil flour, kieselguhr, and by numerous trade names, is a white chalky substance, made up of the minute siliceous skeletons of algae, which, due to its highly porous nature, finds a number of industrial uses, particularly for heat insulation and for filtration purposes. It is found in Canada at many places in Nova Scotia, New Brunswick, Quebec, Ontario, and British Columbia. Almost all the occurrences in eastern Canada are found under lakes or marshes, the most important British Columbia deposits, on the other hand, are massive beds high above the present lakes and rivers in their vicinity.

Production, which started in 1895, was, up till 1928, practically all from Nova Scotia. Since then a little has been produced in Ontario and British Columbia also. In 1933, 1,809 tons of diatomite valued at $37,508 were produced, of which about 95 per cent was exported to the United States. Imports of diatomite and its products, much of it under trade names, amounted to 4,000 tons.

FELDSPAR

Canada has very large feldspar resources, the best known localities where it occurs being in the provinces of Ontario and Quebec; others are in British Columbia and Manitoba. The chief producing areas are in the vicinity of Buckingham, Quebec, and Perth, Ontario. Microcline, the high-potash variety of feldspar, is the one chiefly mined. Feldspar-grinding mills are in operation at Kingston, Ontario, and at Buckingham, Quebec.

In 1933, Canada produced 10,569 tons of feldspar valued at $104,633, as against a maximum of 14,804 tons in 1924. Exports, all crude spar to the United States, were 3,596 tons valued at $23,076; imports, all processed spar, 560 tons valued at $7,970.

FLUORSPAR

Occurrences of fluorspar or fluorite, are known in the provinces of British Columbia, Ontario, Quebec, and New Brunswick. The largest of these, the Rock Candy mine

near Grand Forks in British Columbia, has been operated intermittently since 1918 to supply material for the making of hydrofluosilicic acid to be used in the Consolidated Mining and Smelting Company's lead refinery at Trail, and, at times, for export. There has also been a small intermittent production, since 1905, from near Madoc, Ontario.

Production, which has all been from British Columbia and Ontario, amounted to only 73 tons valued at $1,064 in 1933, as against 17,870 tons, practically all from British Columbia, in the year of maximum production, 1929. Imports in 1933 amounted to 2,219 tons valued at $21,165.

GARNET

Garnet is of widespread occurrence in Canada, but only a few deposits, in Ontario and Quebec, are known to have potential commercial value.

The only recorded production was in 1923 and 1924, when a total of about 1,600 tons was produced near Bancroft, Ontario.

GOLD

Gold is produced in every province of the Dominion, except New Brunswick and Prince Edward Island, as well as in Yukon Territory. Over 98 per cent of the output now comes from lode mines, the remainder from alluvial workings.

Ontario, of which the production is all lode gold, contributes nearly 75 per cent of the total output of the Dominion and, in turn, the combined outputs of the Porcupine and Kirkland Lake camps, all from gold-quartz mines, constitute over 95 per cent of that of Ontario. The remainder of Ontario's production is from small gold mines in other parts of the province and by-product gold from the Sudbury nickel-copper mines. The Lake Shore mine at Kirkland Lake is the Dominion's largest individual producer, and the Hollinger in Porcupine comes a close second.

Much the greatest part of Quebec's gold—about 13 per cent of the annual production of the Dominion—comes from the Noranda gold-copper mine in the northwestern part of the province, though there is also an important production from a number of gold-quartz mines in

the same general locality. The Noranda mine, though primarily a copper mine, is the Dominion's third largest producer of gold. Small amounts of by-product gold are obtained from the working of numerous pyritic deposits in southwestern Quebec and at one time there was a small, intermittent production of alluvial gold in the vicinity of Beauce, also in southern Quebec.

British Columbia, with about 8 per cent of the total production of the Dominion, is the third most important gold-producing province. The largest individual producer is the Pioneer mine in the Bridge River district, the Pioneer mine at Portland Canal now long closed. Following the Pioneer are the Bralorne, near Bridge River, the Canadian Gold Quartz at Barkerville, and the Bell at Sheep Creek. Other small lode gold mines contribute to the total output of the province and considerable by-product gold is obtained from base metal mines, such as the Britannia and Anyox copper mines. There is also a considerable production of placer gold, chiefly from the Atlin and Cariboo districts.

Most of Manitoba's gold, about 4½ per cent of the total output of the Dominion, comes from the Flin Flon copper-zinc-gold mine in the northwestern part of the province. Increasingly important amounts come from gold-quartz mines, chief among which are the San Antonio and the Central Manitoba in the southeast.

With the exception of a very small amount contained in silver-lead ores exported, Yukon's production is all alluvial gold—won for the most part by dredging companies working on a large scale.

Nova Scotia's small output is all obtained from gold-quartz mines; that of Alberta is all placer.

Since 1930 Canada has been the world's second largest gold producer, its output being exceeded only by that of South Africa. Production in 1933 was about 2,947,000 fine ounces, or nearly 12 per cent of the estimated production of the world.

GRAPHITE

Graphite deposits of considerable size occur in the provinces of Ontario, Quebec, New Brunswick, Nova Scotia, and British Columbia and in the Northwest Territories. The Black Donald graphite deposit in Ren-

frew county, Ontario, is reputed to be the largest of its kind on the American continent.

Graphite mining and milling started in the province of Quebec about 1846 and was for many years a thriving industry in the Bancroft and Perth areas in Ontario, and in the Buckingham, Guenette, and St. Remi areas in Quebec; but latterly the increasing competition of Madagascar and Ceylon graphite in foreign markets has greatly reduced its importance.

Production, which, with the exception of a small amount from New Brunswick in the earlier years, has all been from Ontario and Quebec, amounted in 1933 to only 405 tons valued at $18,367—all from the Black Donald mine—as against a maximum production of 3,955 tons in 1916. Exports in 1933 amounted to 987 tons of crude or refined graphite valued at $40,115 and graphite and carbon electrodes to the value of $305,607; imports, including graphite ground and unground, crucibles, and other manufactures of graphite were valued at $100,253.

GYPSUM

There are many large deposits of gypsum in the provinces of Nova Scotia, New Brunswick, Ontario, Manitoba, British Columbia, Quebec, and Alberta. In Nova Scotia it is found in ten of the eighteen counties of the province and was a trade commodity in a small way as early as 1770; the chief producing centres being in Hants county, on the mainland, and Victoria and Inverness counties on Cape Breton island. In New Brunswick, deposits at Hillsborough in Albert county have been worked for more than 70 years. In Ontario, beds in the valley of the Grand river, north of Lake Erie, have been mined since 1822. In Manitoba, large deposits at Gypsumville, 170 miles north of Winnipeg, have been worked since 1901. In British Columbia it was first quarried at Falkland, 40 miles from Kamloops, in 1911. The Quebec deposits, which are on the Magdalen islands, in the Gulf of St. Lawrence, and the Alberta deposits, at McMurray, in the northern part of that province, have not yet been exploited.

Production, of which over 80 per cent has its origin in Nova Scotia, was 376,885 tons valued at $611,846 in 1933; in 1928, when maximum production was attained, the output was 1,246,368 tons. Exports in 1933, nearly all crude

gypsum to the United States were 287,958 tons valued at $3,358,084. Imports, virtually all plaster of Paris and prepared wall plaster, amounted to 769 tons valued at $21,520.

IRON ORE

Deposits of iron ore—magnetite, hematite and limonite, some of them quite large, are known at various points in Canada, especially in the provinces of Ontario and British Columbia, but these are all either too low in iron, contain too much deleterious material, or are too small to be worked economically in competition with foreign ores at the present time. Consequently, Canada's three chief iron-smelting centres use imported ore entirely in their furnaces. At Sydney, Nova Scotia, ore from Newfoundland is the basis of production; at Hamilton and at Sault Ste. Marie, Ontario, ore from the United States Lake Superior district is used.

Up to 1896, when the industry was small, Canada supplied all the ore required by her iron furnaces; but, from that time on, the use of imported ore increased rapidly, and since 1923 practically no iron ore has been shipped from Canadian mines for blast furnace use.

IRON OXIDES (OCHRES), ETC.

Deposits of ochre, wad, and ferruginous clay suitable for the manufacture of paint and of hydrated oxides of iron suitable for the purification of illuminating gas, are known to occur in commercial quantities in the provinces of Quebec, British Columbia, Ontario, Nova Scotia, and New Brunswick.

Production, which includes ochreous iron oxides, metallic oxide, umber, and sienna, and has been chiefly from the valley of the St. Lawrence river in Quebec, amounted to 4,327 tons valued at $52,250 in 1933.

LEAD

The famous Sullivan lead-zinc mine at Kimberley, British Columbia, is probably the largest known deposit of its type in the world. Smaller, but nevertheless important Canadian producers are the Monarch lead-zinc mine at Field, British Columbia, and silver-lead mines at Mayo, Yukon Territory. Formerly some lead was

produced in Ontario, where there is still an inconsiderable output of by-product metal. Quebec and Nova Scotia, also, formerly produced lead from complex base-metal ores.

Over 95 per cent of Canada's lead is produced in the Consolidated Mining and Smelting Company of Canada's plant at Trail, British Columbia, most of it from ore from the Sullivan mine. All the output of this company is marketed as electrolytically refined lead, whereas that of the Monarch mine, the Yukon mines, and of the producers in eastern Canada is sold as lead contained in ore or concentrates.

Total production of lead in Canada in 1933 amounted to 132,165 tons, equivalent to 10 per cent of estimated world production, or about 43 per cent of Great Britain's consumption in that year. Exports were 142,165 tons of pig lead and 3,800 tons of lead contained in ore and concentrates, having a total value of $5,199,319. Imports of lead, consisting almost entirely of lead compounds and other manufactures of lead, had a value of $1,473,515.

LITHIUM MINERALS

The only important known occurrence of lithium minerals in Canada is near Pointe-du-Bois in southeastern Manitoba, where, since 1925, considerable exploratory work has been done on pegmatite dykes carrying spodumene, lepidolite, and amblygonite. Test shipments only have so far been recorded.

MAGNESITE

Hydromagnesite deposits are found in the vicinity of Clinton and of Atlin in the province of British Columbia, where they have been worked to some small extent. Recently, the occurrence of hard magnesite of good quality and in large deposits has been reported at Cranbrook and in the Bridge River area, in the same province. However, up to the present, much the most important sources of this type of material in Canada are deposits of high-magnesian dolomite suitable for most of the uses to which magnesite is put, which are found in Argenteuil county in the province of Quebec. The Quebec material is marketed

in the caustic calcined form and as dead-burned clinker. It finds its chief use as a basic refractory for lining metallurgical furnaces.

Production of calcined and dead-burned clinker in 1933—all from the Quebec deposits—was valued at $260,128. Exports amounted to 2,520 tons valued at $61,056; imports, chiefly magnesite brick, etc., were valued at $425,110.

MAGNESIUM SULPHATE (EPSOMITE)

Saline lakes containing natural magnesium sulphate are found in the provinces of British Columbia, Alberta, and Saskatchewan. Marketable material is obtained from these either by evaporation of brines or by harvesting in crystal form and subsequently dissolving and recrystallizing.

In British Columbia, small shipments were made between 1915 and 1923 from Spotted lake, near Kruger mountain, in Osoyoos mining division, from a lake near Clinton, in Lillooet mining division, and from several lakes on Basque ranch, 15 miles west of Asheroft.

In Saskatchewan a small amount of magnesium sulphate has been produced in an experimental way from the natural brine of Muskiki lake, near Dana.

There was no production between 1923 and 1933 and only 80 tons valued at $2,000, from Basque B.C., in the latter year. Total recorded production to date has been about 8,814 tons. Imports in 1933 amounted to 2,135 tons valued at $49,868.

MANGANESE

Manganese oxides, including pyrolusite, manganite, psilomelane, and bog manganese, occur in the provinces of Nova Scotia, New Brunswick, British Columbia, and Quebec; and have been mined intermittently to some small extent in the first three. Most of the output has been high-grade material suitable for use in the manufacture of dry batteries and in the chemical industry. Deposits of material capable of being worked continuously on a large scale, to supply, for example, the requirements of the steel industry, are not known to exist in Canada.

With the exception of a few occasional shipments aggregating a few hundred tons, there has been no production since 1924. Imports in 1933 amounted to 34,342 tons of manganese oxides valued at $293,910.

MERCURY OR QUICKSILVER

Occurrences of mercury-bearing minerals are known at Kamloops; on Seehart channel; in the Bridge River area; and in placer diggings on the Fraser river, in the province of British Columbia. It has also been found in some of the silver ores of Cobalt and in some gold ores, in Ontario, but in amounts so small as to be of purely scientific interest.

With the exception of inconsiderable amounts from the Kamloops deposit between 1895 and 1897—and again in 1926—there has been no production.

MICA

Mica deposits of commercial value—more especially of phlogopite, or amber mica—are widely distributed in the southeastern part of the province of Ontario and in the adjoining portion of the province of Quebec. In Ontario, mica mining has been carried on for many years, chiefly in an area of some 900 square miles in the counties of Lanark, Frontenac, and Leeds; in Quebec, in an area of about 1,200 square miles in the region adjacent to the Gatineau and Lièvre rivers in Hull and Papineau counties. Muscovite, or white mica occurrences, on which some exploratory work has been done, are found on the north shore of the Lower St. Lawrence river and on the shores of Hudson strait, in Quebec; in eastern and in northern Ontario; and in the Cariboo, Revelstoke, and Omineca mining divisions in British Columbia.

Canada was at one time the world's chief producer of amber mica; and the Lacey mine near Sydenham, Ontario was, until closed down some years ago, reputedly the world's largest mica mine. The competition of cheap foreign mica in the world's markets has, however, caused a serious decline in the mica industry of the Dominion. Production in 1933 was made up of 8,591 pounds of knife-trimmed mica worth 16 cents a pound; 51,881 pounds of thumb-trimmed worth 16 cents a pound; 73,150 pounds of splittings worth 37 cents a pound; and 1,575,875 pounds of scrap (for grinding) worth $\frac{1}{10}$ of a cent a pound, or a total of 1,709,497 pounds valued at $48,082. Exports were 26 tons of rough-cobbed and thumb-trimmed mica valued at $6,445; 38 tons of mica splittings valued at $29,479; 1,076 tons of scrap mica valued at

$9,600 and manufactures, mica to the value of $7,20[illegible] Mica and manufactures thereof to the value of $3,500 were imported.

MINERAL WATERS

Mineral springs, the waters of which can be classified under one or other of the headings table waters, aerated waters, or medicinal waters for external use, are found at many places in Canada, the more important springs that have been exploited commercially being located in Kings county, New Brunswick; Chambly, Champlain, Kamouraska, Hochelaga, Maskinonge, Quebec, St. Hyacinthe, St Maurice, Two Mountains, Verchères and Yamaska counties, Quebec; Bruce, Carleton, Huron, Lanark, Prescott, and Russell counties, Ontario; Regina and Manitou, Saskatchewan; Banff, Alberta; and West Kootenay, British Columbia.

The waters of several of these Canadian springs are similar in composition to well known imported waters and at many of them bottling works are operated. Production in 1933 amounted to 38,818 Imperial gallons valued at $5,441, all from Ontario and Quebec, as against a production of over 300,000 Imperial gallons in 1927.

MOLYBDENUM

Numerous deposits of molybdenite, MoS_2, occur in Canada, scattered over the provinces of Ontario, Quebec, New Brunswick, Nova Scotia, Manitoba, and British Columbia. The best known of these is the Moss mine, in Pontiac county, Quebec, which has supplied most of the Canadian production. Other of the better known deposits are the Mount St. Patrick mine, Renfrew county, and the Wilberforce mine, Haliburton county, Ontario; and the La Corne mine, Abitibi county, Quebec.

Canada made important contributions of molybdenum to the Allied cause during the Great War, but since that time production has virtually ceased, the few small shipments recorded since being concentrates produced from experimental runs.

In 1933, Canada imported 7,082 pounds of calcium molybdate valued at $3,414.

NATURAL GAS

Natural gas is found in Canada in the provinces of Alberta, Ontario, New Brunswick, Manitoba, Quebec, Saskatchewan, and British Columbia. The most important gas-field is that in Turner Valley, Alberta, where a wet gas with a large naphtha content is obtained. Other important Alberta gas-fields are those at Viking, Medicine Hat, and Foremost. Ontario gas-fields are in the southwestern part of the province, just north of Lake Erie. They were the first to be found and utilized in the Dominion but their output, though still very important, is not so large as formerly. In New Brunswick, a small field near Moncton supplies that city with gas. The known occurrences in Manitoba, Saskatchewan, and British Columbia are of little importance.

In 1933, 22,706,125 thousand cubic feet of gas valued at $8,283,944 was produced and utilized in Canada: 65·7 per cent coming from Alberta wells; 31·6 per cent from Ontario wells; the remainder virtually all from New Brunswick. In Turner valley there is a considerable wastage of gas that has been stripped of its naphtha.

NICKEL

Virtually all the nickel produced in Canada has its source in the nickel-copper ores of the Sudbury district, Ontario, where there are two operating companies—The International Nickel Company of Canada and a much smaller concern, Falconbridge Nickel Mines, Ltd. A further small amount is recovered annually in the treatment of the silver-cobalt-nickel ores of the Cobalt district. The International Company separate most of their nickel from the accompanying copper at Copper Cliff, Ontario, near the mines, and send the crude nickel so obtained to their refinery at Port Colborne, Ontario, for electrolytic refining. They also send a certain amount of nickel-copper matte to their plants at Clydach, Wales, and Huntington, West Virginia, U.S.A., for final treatment. The Falconbridge Company make nickel-copper matte at the mine and send this to their refinery in Norway for separation and refining.

Over 90 per cent of the world's requirements of nickel has its origin in Ontario, Canada, the only other producing country of importance being New Caledonia. Canadian

production in 1933 amounted to 41,632 tons valued at $20,130,180. Exports, valued at $22,795,968, consisted of 44,041 tons of nickel contained in refined metal, oxide and matte; imports, valued at $1,051,915, were of nickel in manufactured and semimanufactured form, chiefly of plated-ware and of nickel or German silver.

OIL SHALE

Petroliferous shales, commonly called oil shales, are widely distributed in Canada. Large bodies of good grade are known in Albert and Westmorland counties, New Brunswick, and in Pictou and Antigonish counties, Nova Scotia. Lower grade deposits of considerable extent occur in Gaspe county, Quebec; in Lambton and Grey counties and along the Mattagami and Abitibi rivers in Ontario, and in the northern portions of Manitoba, Saskatchewan, and British Columbia.

Some experimental work has been done in recent years on material from the New Brunswick and Nova Scotia deposits, but commercial exploitation has not as yet been attempted.

PETROLEUM

Petroleum has been found in Canada in the provinces of Alberta, Ontario, and New Brunswick, and in the Northwest Territories. Much the most important oil-field is in Turner Valley, Alberta, where many of the wells are, strictly speaking, not oil wells but wells yielding "wet" gas from which naphtha is recovered by condensation. Less important fields in Alberta are at Wainwright and Red Coulee. The Ontario oil-fields, the first to be operated in the Dominion, but of which the output is now on the decline, are all in the southwestern corner of the province in the peninsula lying between Lakes Huron and Erie, where the Petrolia-Oil Springs area is still the most important field, though it has been producing since 1861. New Brunswick's small oil-field, near Moncton, has been productive since 1910. In the Northwest Territories oil was found on the bank of the Mackenzie river, near Norman, in 1920, and this field is now being exploited to supply a local demand resulting from the discovery of radium and silver deposits at Great Bear lake.

Canada's petroleum production, which falls far short of filling domestic requirements, amounted to 1,148,916 barrels valued at $3,083,995 in 1933. Of this, Alberta supplied approximately 87·0 per cent, and Ontario 11·8 per cent. Imports of crude petroleum and petroleum products, on the other hand, had a value of $31,046,337.

PHOSPHATE

Deposits of apatite or mineral phosphate of considerable extent are known in the provinces of Quebec, Ontario, and British Columbia. The eastern deposits are found in pegmatitic veins or dykes usually associated with amber mica, and their range is virtually conterminous with that of the mica-producing areas of southeastern Ontario and southwestern Quebec. The British Columbia deposits, which are found in the Crowsnest Pass district, are sedimentary beds.

At one time apatite mining in eastern Canada was a thriving industry, but latterly the competition of cheap foreign phosphate has virtually driven the Ontario and Quebec material off the market, so that the small production from this source in recent years has been almost entirely a by-product of mica-mining. The Crowsnest Pass beds, on which considerable development work has been done since 1926, though extensive, furnish only low-grade material that must be concentrated to yield a commercial product, consequently production from them has been more or less tentative.

In 1933, 2,214 tons of phosphate valued at $5,475 was produced in Canada: 2,109 tons of it in British Columbia and 105 tons in Quebec. Imports amounted to 18,351 tons of phosphate rock valued at $74,527. There was no export.

PLATINUM GROUP METALS

With the exception of a few ounces of alluvial platinum recovered annually from the washing of river sands in the Tulameen district and small amounts of platinum and palladium recovered occasionally at the Consolidated Mining and Smelting Company's metallurgical plant at Trail, in British Columbia, Canadian production of the platinum group metals—platinum, palladium, iridium, rhodium, ruthenium, and osmium—is all obtained as a by-product of the working of the nickel-copper ores of

Sudbury, Ontario. In these the platinum metals are present in quantities so small as to be utterly out of consideration in the raw ore, but during the process of extracting the nickel they become concentrated in that metal and are later found in important amounts in the sludge left in the bottoms of the electrolytic tanks in the nickel refinery. Sludge from the International Nickel Company's refinery at Port Colborne, Ontario, is sent to the same company's plant at Acton (near London, England) where the platinum metals are separated and refined.

Canada is the largest producer of platinum in the British Empire, and at least the second largest producer in the world—her output being exceeded, possibly, by that of Russia. Production in 1933 amounted to 24,786 fine ounces of platinum and 31,009 fine ounces of palladium, rhodium, etc., the whole valued at $1,502,634. Exports of platinum, chiefly contained in residues, matte, etc., amounted to 29,417 ounces valued at $1,174,004; imports, nearly all of manufactured platinum, had a value of $73,974.

PYRITES

Deposits of iron pyrites (sulphide of iron) suitable for the manufacture of sulphuric acid, are found in many different parts of Canada, notably in the provinces of Quebec, Ontario, and British Columbia. Cupriferous pyrites have been mined at Eustis in the Eastern Townships and at the Aldermac mine, Quebec; the ore at both places being concentrated and the small copper content separated out by flotation. Large deposits of non-cupriferous pyrites were formerly worked at Northpines and Goudreau in northwestern, and also at various points in southeastern Ontario. In British Columbia by-product pyrites in the form of flotation concentrates are produced at the Britannia and Anyox copper mines and at the Sullivan lead-zinc mine.

The mining of pyrites—largely for export—at one time a flourishing industry in Canada, has now almost completely disappeared due to the competition of cheap native sulphur of foreign origin. Furthermore, much of the domestic demand for sulphuric acid is now filled by the utilization of formerly wasted sulphurous smelter gases at Sudbury, Ontario, and Trail, British Columbia. Present production is, therefore, confined to pyrites con-

taining a recoverable copper content, as at the Eustis and Aldermac mines in Quebec, and to by-product pyrites. In 1932 the sulphur content of pyrites produced and smelter gases utilized was 57,373 tons valued at $510,299. Exports were pyrites with a sulphur content of 15,347 tons valued at $121,280. Imports were 140,816 tons of native sulphur valued at $2,529,920, largely for use in the pulp and paper industry.

RADIUM (AND URANIUM)

Much the most important, and the only productive occurrences of radium in Canada are at Great Bear lake, in the Arctic Circle, in the Mackenzie district of the Northwest Territories, where radioactive pitchblende associated with rich silver ore was found in 1930. Some exploratory work has also been done on an occurrence of radioactive minerals at Wilberforce, Ontario.

Eldorado Gold Mines, Ltd., the only company yet producing, ship radioactive material from their mine on Labine point, Great Bear lake, to their treatment plant at Port Hope, Ontario, where radium and uranium are recovered in the form of salts of these elements. Delivery of radium compounds from the Port Hope plant started in 1933.

SALT

Large deposits of sodium chloride, or common salt, are known to occur in four Canadian provinces, viz., Ontario, Nova Scotia, New Brunswick, and Alberta, and are being exploited in two—Ontario and Nova Scotia. The Ontario salt beds, which were discovered in 1866 and have been continuously productive ever since, underlie an area of about 3,000 square miles in the southwestern angle of the province, the principal producing plants or large and important chemical industries based on the use of salt being located at or near the towns of Sandwich, Sarnia, Goderich, and Kincardine. The process of recovering the salt consists in forcing water down into the beds through bore holes, pumping it back to the surface when it has become saturated with salt, and then evaporating the brines so obtained. In Nova Scotia, rock salt was first discovered in 1918, when large and valuable deposits were found by borings made at Malagash in Cumberland county. Here

the salt is mined by ordinary underground methods at shallow depth, and the bulk of the output is ready for market after simply crushing and screening. Additional recovery is attained, however, by leaching the waste dumps with water and evaporating the resulting brine.

Beds of rock salt, the exploitation of which has not yet been undertaken, have been found also in deep borings near the towns of Amherst and Windsor, Nova Scotia, near the village of Gautreau, New Brunswick; and near the town of McMurray, in northern Alberta.

Production of salt in Canada in 1933 amounted to 280,114 tons valued at $1,959,853; and imports to 135,620 tons valued at $651,257. Exports were 5,335 tons valued at $43,461.

SELENIUM

Selenium in Canada is obtained as a by-product of copper refining. It was recovered as metal first from residual slimes at the Ontario Refining Company's plant at Copper Cliff, Ontario, in 1931. It is now being produced also at the plant of Canadian Copper Refiners, Ltd., at Montreal East, Quebec.

Production of selenium in Canada in 1933 amounted to 26,090 pounds valued at $53,745. Exports and imports are not recorded.

SILICA

Silica, in one or other of the various forms of sand, sandstone, quartzite, or quartz, is widely distributed in Canada, where it is in steady demand for use in domestic industries, such as glass-making, foundries, smelters, refractory brick manufacture, etc.

In 1933, silica in the form of crushed quartz and quartzite, sand, etc., to the amount of 185,807 tons valued at $298,497, was produced in Canada. There were also importations of 6,647 tons of the same type of material valued at $109,439.

SILVER

The Sullivan lead-zinc mine in British Columbia is now the largest individual source of silver in the Dominion, and British Columbia the largest producing province.

Others of the more important British Columbia producers of silver are the Premier gold mine and the copper mines at Britannia and at Anyox. In Ontario, the second largest producing province, the silver mines at Cobalt and Gowganda still contribute most of the output, followed by the Sudbury nickel-copper mines and the gold mines. Yukon's output, with the exception of a small amount associated with alluvial gold, is all contained in silver-lead ores exported. Manitoba's chief source is the Flin Flon copper-zinc mine; and Quebec's, the Noranda gold-copper mine. A potential future source of great promise, but from which there is as yet no steady production, is the rich silver ore found associated with radioactive minerals at Great Bear lake in the Northwest Territories.

Canada is the largest producer of silver in the British Empire and the third largest in the world, but with the gradual depletion of the famous silver mines of Cobalt, Ontario, production has become more and more a by-product of base-metal and gold mining. In 1933 production amounted to 15,201,265 fine ounces valued at $5,751,064. Exports consisted of 10,738,729 ounces of silver bullion and of 3,362,354 ounces contained in ore, concentrates, etc., or a total of 14,101,083 fine ounces having a value of $4,852,851; while imports, chiefly silver bars, were valued at $747,816.

SODIUM CARBONATE

Lacustrine deposits of natural sodium carbonate are found in a number of places in the province of British Columbia, notably in the Clinton and Kamloops mining divisions. Since 1921 there has been a small annual production from some of these. In 1933 the output was 253 tons valued at $2,471.

SODIUM SULPHATE

Natural sodium sulphate, both in crystal form and as a constituent of brine, is found in numerous lakes and sloughs scattered over the Prairie Provinces and British Columbia. Since 1921 there has been a fairly steady production of this material, all or nearly all from Saskatchewan, for use in pulp and paper mills, and for metallurgical use after transformation into nitre cake in the separation of nickel and copper. The output is shipped either as the hydrated salt (Glauber's salt) or dehydrated as salt cake.

Production in 1933, all from Saskatchewan, where four plants are in operation, was valued at $485,416. A certain amount of this was exported, but the actual quantities are not separately recorded in published trade records. Imports of Glauber's salt, salt cake, and nitre cake amounted to 4,064 tons valued at $63,597.

STONE, BUILDING, MONUMENTAL, AND CRUSHED

Canada possesses, widely distributed, of good quality and in great abundance, nearly every kind of stone commonly used for structural, industrial, or monumental purposes.

GRANITE

Granite, including under this heading, as is the custom in the trade, in addition to granite properly so-called syenite, trap, and other crystalline igneous rocks, occurs in abundance in readily accessible localities in Nova Scotia, New Brunswick, Quebec, Ontario, and British Columbia. Much of the output is used for road building; considerable quantities also for building stone, paving blocks, curb stone, monuments, etc.

LIMESTONE

Limestone is abundant in all the provinces except Prince Edward Island, and is quarried more extensively than any other Canadian stone. About 64 per cent of the output is normally crushed limestone for road metal, railway ballast, concrete aggregate, etc.; about 5 per cent is used as smelter flux; 2·5 per cent in pulp and paper mills, sugar refineries, and various chemical plants, and 1·5 per cent as building, monumental, and decorative stone.

MARBLE

In addition to many still-unexploited deposits throughout the Dominion, marble is quarried in Quebec, Ontario, Manitoba, and British Columbia. Besides ordinary white and grey marbles, Canadian occurrences include many mottled and coloured varieties, some of them of striking beauty.

SANDSTONE

Sandstones of various types are quarried in every province except Manitoba and Saskatchewan for use mostly as crushed stone or as building stone.

In 1933 Canada produced 360,398 tons of granite valued at $748,470; 2,486,359 tons of limestone valued at $2,087,207 (exclusive of limestone used for the making of lime and cement); 8,512 tons of marble valued at $53,234; and 82,666 tons of sandstone valued at $101,574. Imports of stone were valued at $236,235; exports at $91,340.

TALC

Talc in both the pure form and in soapstone is known to occur at a number of places in Canada. Deposits near Madoc in southeastern Ontario, which yield a fine, white, foliated talc unsurpassed for most purposes, are among the largest of their kind on the American continent. Recently attention has been drawn to deposits of high-grade massive talc at the base of mount Whymper in British Columbia. Grey talc of a lower grade has been found at other points in the same province.

Large deposits of soapstone are found in the Eastern Townships, Quebec, where they have been worked at Broughton, since 1922, for the production of furnace blocks for kraft-pulp mills, monuments, stoves, mantels, and other articles. Some powdered grey talc also is produced here. Soapstone is also of widespread occurrence in the country between Port Arthur and Kenora in western Ontario, where a plant for the production of cut soapstone was for a time operated at Vermilion Bay.

Production of talc in 1933—nearly all of it high-grade, powdered white talc from the Madoc district—amounted to 15,169 tons valued at $143,014. In addition there was a production of soapstone valued at $43,593. Exports (to the United States and Europe) were 10,725 tons valued at $116,950; imports were 2,149 tons valued at $18,650.

TIN

Occurrences of tin-bearing minerals are known at a number of localities in Canada and a little exploratory work has been done on some of them. So far, however, they have all proved of more academic than of industrial interest.

TITANIUM

Large bodies of ilmenite carrying from 18 to 25 per cent titanium occur in the province of Quebec at St. Urbain, Charlevoix county, and at Lac Tetreault, Terrebonne county. While there is no steady production, small shipments from these are made from time to time to the United States, for use in the manufacture of ferro-titanium. It is estimated that something over 10,000 tons of ilmenite have been so shipped in the last 20 years.

TUNGSTEN

The tungsten minerals, scheelite, wolframite and tungstite—more especially scheelite—occur at a number of places in Canada. Commercially successful attempts have been made to exploit some of the occurrences in the Maritime Provinces, but resulting production has been negligible.

VOLCANIC DUST

Extensive beds of volcanic dust, material from which has been used to some extent to replace powdered pumice in the manufacture of cleansers, scouring powders, and abrasive soaps, are found at a number of places in the provinces of Saskatchewan and British Columbia. Production so far has been very small; none was recorded in 1933.

ZINC

Approximately 76 per cent of Canada's zinc has its origin in British Columbia and most of this in turn comes from the Consolidated Mining and Smelting Company's famous Sullivan lead-zinc mine at Kimberley. Other important producers in this province are the Monarch zinc-lead-silver mine near Field, and the Britannia copper mine. Small mines, mostly in Kootenay district, supply the balance of the output. Outside British Columbia the only producer at present operating in Canada is the Hudson Bay Mining and Smelting Company's copper-zinc-gold mine at Flin Flon in Manitoba. In addition to mines now actually producing zinc, however, there are a number of potential producers equipped but not operating, in Manitoba, Ontario, Quebec, and Nova Scotia.

With the exception of the outputs of the Monarch and Britannia mines, which are exported in concentrates, virtually all the zinc produced in British Columbia is treated at the Consolidated Mining and Smelting Company's reduction works at Trail and marketed as electrolytic zinc

refined zinc. The Flin Flon output also is treated in an electrolytic reduction works, located at the mine, and marketed as highly refined metal.

Canada is the largest producer of zinc within the British Empire, and contributes over 8 per cent of the world's total output. Production in 1933 amounted to 98,842 tons valued at $6,346,682. Exports were 86,727 tons of refined zinc, 1,163 tons contained in concentrates, etc., and 3,151 tons in scrap and dross. Imports—chiefly lithopone, zinc white, manufactures of zinc, zinc chloride and zinc sulphate—were valued at $1,273,431.

EXPLANATORY REMARKS AND GENERAL INFORMATION

The functions of the Dominion Department of Mines are largely scientific and are primarily concerned with geological and mineralogical studies and with investigations of mineral resources and their technology. Dominion-wide exhibitions and investigations are conducted and elaborate reports furnished to the public as to the natural resources of the Dominion in respect to mineral, forest, fuel, water supply, etc.

Test and research investigations are carried on in experimental stations and laboratories equipped for the purpose. These include an ore testing station at the fuel testing station a ceramic laboratory, a road materials testing laboratory, equipment for the testing of metals and structural materials and a general Departmental chemical laboratory, all at Ottawa. Also at Ottawa, in addition to an Economic Mineral Museum, the Department has under its jurisdiction the National Museum of Canada, containing exhibits in geology, mineralogy and natural history of both utilitarian and cultural values.

Applications for reports and particulars relative to technological investigations and mineral resources should be made to The Director, Mines Branch, Department of Mines, Ottawa, and for information on subjects relating to general and economic geology to The Director, Bureau of Economic Geology, Department of Mines, Ottawa.

Statistics.—Canadian production figures used are those published by the Dominion Bureau of Statistics in the Department of Trade and Commerce, to which Department application may be made for more detailed statistical records.

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